correct its dependency and claim 15 has been amended to more distinctly claim the invention. No new matter is added by virtue of the claim amendments.

Claims 23-48 have been added to point out more specifically the subject matter of the present invention. Support for the new claims is found throughout the specification and drawings. No new matter is added by virtue of the new claims.

While the claims as submitted with the original application conform to U.S. statutory requirements and are believed to be allowable, it is hereby requested that the claims in this preliminary amendment be considered for examination. The purpose in submitting these amended and new claims is merely a matter of preference in describing the claimed invention, and is not meant as a reflection of changes deemed necessary for patentability purposes.

The claims as submitted herein are believed to be in condition for allowance, and allowance of the application is respectfully requested. In addition, it is requested that any fees due be charged to Deposit Account Number 50-0877 with reference to (RDID 0061 US).

Respectfully submitted,

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MARKED-UP VERSION OF THE PRIOR PENDING PARAGRAPHS

Page 1, first full paragraph, beginning at line 1:

--BACKGROUND AND SUMMARY OF THE INVENTION--

The present invention concerns a pump for flow rates in the range from about 1 to 1000 nl/min. The pumps according to the invention are particularly suitable for applications in the field of medical diagnostics such as microdialysis or ultrafiltration.

Page 12, fourth full paragraph, beginning at line 26:

--BRIEF DESCRIPTION OF THE DRAWINGS--

The present invention is elucidated in more detail by figures.

Page 13, seventh full paragraph, beginning at line 11:

--DETAILED DESCRIPTION OF THE INVENTION--

Figure 1 shows a cross-section through a pump according to a first embodiment. The arrangement shown has a channel (2) having a diameter of 100 µm in which a transport liquid is located. Water was chosen as the transport liquid in the case shown. The channel is closed with a wettable membrane (4) in a region of the transport channel with an enlarged cross-section. In the present case a BTS 65 from the Memtec Company (now: USF Filtration and Separations Group, San Diego, CA, USA) (PESu hydrophilized with hydroxypropyl cellulose) was used as the membrane. This very hydrophilic membrane is asymmetric and has pores in the range from about 10 µm on one side and 0.1 µm on the other side. The side with the larger pores faces the liquid. A non-wettable membrane made of expanded PTFE is located above the wettable membrane (4). The non-wettable membrane is mounted on the wettable membrane in such a manner that it completely covers the side of the wettable membrane (4) which faces away from the transport liquid (3). The figure shows that the arrangement was selected such that the transport liquid can only evaporate from the channel system via the wettable membrane (4). The system comprising the wettable (4) and non-wettable membrane (5) is surrounded by a housing (7) in such a manner that evaporated transport liquid can only reach the interior of the housing or vessel (7). The interior of the housing (7) contains a sorbent (6) which is silica

gel in the present example (molecular sieve MS 518, Grace Favison, Baltimore, Maryland, USA). Figure 1 also shows that the sorbent is in direct contact with the non-wettable membrane. As described above this is possible because the non-wettable membrane prevents a fluid short-circuit i.e. a direct sorbtion of liquid from the capillaries of the wettable membrane without a gaseous/ vaporous intermediate phase. The pump shown achieved in experiments a flow rate in the range of 1 to 1000 nl/min (nanolitres per minute) in the direction of the arrow (8).

VERSION WITH MARKINGS TO SHOW CHANGES MADE

4. (Amended) Pump as claimed in claim 2 [or 3], in which the sorbent is located in a housing [(7)] having an opening, wherein the opening is closed by the membrane.

5. (Amended) Pump as claimed in claim [3 or] 4, in which the sorbent has no direct contact with the membrane.

8. (Amended) Pump as claimed in claim [1] 2, in which the membrane has a hydrophilic region facing the transport liquid and a hydrophobic region which faces the sorbent.

14. (Amended) Pump as claimed in claim 12 [or 13], in which the capillary channels are manufactured by microtechnology using etching processes, laser machining, or by stamping, injection moulding or moulding processes.

15. (Amended) Pump as claimed in claim 12, in which the array comprises 3 to 100[, preferably 5 to 25] capillary channels.

23. Pump as claimed in claim 3, in which the space contains a sorbent and in which the sorbent is located in a housing having an opening, wherein the opening is closed by the membrane.

24. Pump as claimed in claim 23, in which the sorbent has no direct contact with the membrane.

25. Pump as claimed in claim 13, in which the capillary channels are manufactured by microtechnology using etching processes, laser machining, or by stamping, injection moulding or moulding processes.

26. A pump comprising:

a housing defining a space and including a channel, the channel being at least partially filled with a transport liquid, and

a membrane positioned in the housing, the membrane including a first side facing toward the liquid and a second side facing the space, wherein the space has an essentially constant vapour pressure of the transport liquid.

27. The pump of claim 26 further comprising a sorbent positioned in the space.

28. The pump of claim 27 wherein the sorbent is spaced apart from the membrane.

29. The pump of claim 27 wherein the membrane separates the transport liquid and the space from one another.

30. The pump of claim 26 wherein the membrane separates the transport liquid and the space from one another.

31. The pump of claim 26 wherein the housing comprises a means for exchanging evaporated transport liquid with a space outside the housing.

32. The pump of claim 26 wherein the membrane is hydrophilic.

33. The pump of claim 26 wherein the membrane has a hydrophilic region facing the transport liquid and a hydrophobic region facing the space.

34. The pump of claim 26 further comprising at least one non-wettable membrane positioned in the space.

35. The pump of claim 26 further comprising a working liquid positioned in the channel that is segmented from the transport liquid.

36. The pump of claim 26 wherein the membrane is formed to include capillary channels.

37. The pump of claim 36 wherein the membrane includes 3 to 100 capillary channels.

38. The pump of claim 37 wherein the membrane includes 5 to 25 capillary channels.

39. The pump of claim 36 wherein the capillary channels each have a diameter of 10 nm to 100 μm.

40. The pump of claim 36 wherein the housing includes a base plate and a cover and the channel is formed in the base plate.

41. The pump of claim 40 wherein the membrane is disposed between the base plate and the cover.

42. The pump of claim 40 wherein the space is formed in the cover.

43. The pump of claim 36 wherein the housing is formed to include openings in communication with the space.

44. A method of producing flow rates of a transport liquid of about 1 to 1000 nl/min, the method comprising the steps of:

providing a pump comprising a housing defining a space and including a channel and a wettable membrane positioned in the housing, the membrane including a first side facing toward the channel and a second side facing the space,

at least partially filling the channel with the transport liquid,

contacting the wettable membrane with the transport liquid to generate an underpressure in the channel,

evaporating the transport liquid at the wettable membrane to remove the transport liquid from the channel and to create an underpressure in the channel, and

maintaining a generally constant vapour pressure of the transport liquid in the space.

45. The method of claim 44 wherein the transport liquid penetrates the membrane due to capillary effects.

46. The method of claim 45 wherein the transport liquid evaporates through the membrane.

47. The method of claim 44 further comprising the step of at least partially filling the channel with a working liquid.

48. The method of claim 47 further comprising the step of segmenting the transporting and working liquids.